

FORM PTO-1390

U.S. Department of Commerce Patent and Trademark Office

Attorney's Docket No.

1137-788

**TRANSMITTAL LETTER TO THE UNITED STATES
DESIGNATED/ELECTED OFFICE (DO/EO/US)
CONCERNING A FILING UNDER 35 U.S.C. 371**

U.S. Application No. (if known, see 37 CFR 1.5)

09/367829

INTERNATIONAL APPLICATION NO.
PCT/JP97/04792

INTERNATIONAL FILING DATE
December 24, 1997

PRIORITY DATE CLAIMED

TITLE OF INVENTION
RADIO COMMUNICATION SYSTEM

APPLICANT(S) FOR DO/EO/US
Atsuya KUME

Applicant herewith submits to the United States Designated/Elected Office (DO/EO/US) the following items and other information:

1. ☒ This is a **FIRST** submission of items concerning a filing under 35 U.S.C. 371
2. ☐ This is a **SECOND** or **SUBSEQUENT** submission of items concerning a filing under 35 U.S.C. 371.
3. ☒ This express request to begin national examination procedures (35 U.S.C. 371(f)) at any time rather than delay examination until the expiration of the applicable time limit set in 35 U.S.C. 371(b) and PCT Articles 22 and 39(1).
4. ☐ A proper Demand for International Preliminary Examination was made by the 19th month from the earliest claimed priority date.
5. ☒ A copy of the International Application as filed (35 U.S.C. 371(c)(2))
 - a. ☐ is transmitted herewith (required only if not transmitted by the International Bureau).
 - b. ☒ has been transmitted by the International Bureau.
 - c. ☐ is not required, as the application was filed in the United States Receiving Office (RO/US)
6. ☒ A translation of the International Application into English (35 U.S.C. 371(c)(2)).
7. ☒ Amendments to the claims of the International Application under PCT Article 19 (35 U.S.C. 371(c)(3))
 - a. ☐ are transmitted herewith (required only if not transmitted by the International Bureau).
 - b. ☐ have been transmitted by the International Bureau.
 - c. ☐ have not been made; however, the time limit for making such amendments has **NOT** expired.
 - d. ☒ have not been made and will not be made.
8. ☐ A translation of the amendments to the claims under PCT Article 19 (35 U.S.C. 371(c)(3)).
9. ☒ An oath or declaration of the inventor(s) (35 U.S.C. 371(c)(4)).
10. ☐ A translation of the annexes to the International Preliminary Examination Report under PCT Article 36 (35 U.S.C. 371(c)(5)).

ITEMS 11. TO 16. below concern other document(s) or information included:

11. ☒ An Information Disclosure Statement under 37 CFR 1.97 and 1.98.
12. ☒ An assignment document for recording. A separate cover sheet in compliance with 37 CFR 3.28 and 3.31 is included.
13. ☐ A **FIRST** preliminary amendment.
☐ A **SECOND** or **SUBSEQUENT** preliminary amendment.
14. ☐ A substitute specification.
15. ☐ A change of power of attorney and/or address letter.
16. ☒ Other items or information: PCT/IB/308, PCT/ISA/210

U.S. APPLICATION NO. **09/367829**INTERNATIONAL APPLICATION NO.
PCT/JP97/04792ATTORNEY DOCKET NO.
1137-788

17. [X] The following fees are submitted:

Basic National Fee (37 CFR 1.492)(a)(1)-(5):

Search Report has been prepared by the EPO or JPO	\$ 840.00
International preliminary examination fee paid to USPTO (37 CFR 1.482)	\$ 670.00
No international preliminary examination fee paid to USPTO (37 CFR 1.482) but international search fee paid to USPTO (37 CFR 1.445(a)(2))	\$ 760.00
Neither international preliminary examination fee (37 CFR 1.482) nor international search fee (37 CFR 1.445(a)(2)) paid to USPTO	\$ 970.00
International preliminary examination fee paid to USPTO (37 CFR 1.482) and all claims satisfied provisions of PCT Article 33(2)-(4)	\$ 96.00

ENTER APPROPRIATE BASIC FEE AMOUNT =CALCULATIONSPTO USE ONLY**\$ 840.00**

Surcharge of \$130.00 for furnishing the oath or declaration later than [] 20 [] 30 months from the earliest claimed priority date (37 CFR 1.492(e)).

\$

Claims

Number Filed

Number Extra

Rate

Total Claims

7 -20 =

0

X \$18.00

\$

Independent Claims

3 -3 =

3

X \$78.00

\$

Multiple dependent claim(s) (if applicable)

+ \$260.00

\$

TOTAL OF ABOVE CALCULATIONS =

\$

Reduction by 1/2 for filing by small entity, if applicable. Verified Small Entity statement must also be filed. (Note 37 CFR 1.9, 1.27, 1.28).

\$

SUBTOTAL =

\$

Processing fee of \$130.00 for furnishing the English translation later [] 20 [] 30 than months from the earliest claimed priority date (37 CFR 1.492(f)).

\$

TOTAL NATIONAL FEE =

\$

Fee for recording the enclosed assignment (37 CFR 1.21(h)). The assignment must be accompanied by an appropriate cover sheet (37 CFR 3.28, 3.31). \$40.00 per property

+ \$ 40.00

TOTAL FEES ENCLOSED =**\$880.00**Amount to be
refunded

\$

charged

\$

a. [X] A check in the amount of \$840.00 and \$40.00 to cover the above fees is enclosed.

b. [] Please charge my Deposit Account No. 02-2135 in the amount of \$_____ to cover the above fees. A duplicate copy of this sheet is enclosed.

c. [X] The Commissioner is hereby authorized to charge any additional fees which may be required, or credit any overpayment to Deposit Account No. 02-2135. A duplicate copy of this sheet is enclosed.

NOTE: Where an appropriate time limit under 37 CFR 1.494 or 1.495 has not been met, a petition to revive (37 CFR 1.137(a) or (b)) must be filed and granted to restore the application to pending status.

SEND ALL CORRESPONDENCE TO:

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32,408

Registration Number

RADIO COMMUNICATION SYSTEM

TECHNICAL FIELD

The present invention relates to a radio
5 communication system for the radio communication between
portable radio terminals and a base station in a
communication area.

BACKGROUND ART

10 Referring to Fig. 1 illustrating a radio
communication system including portable radio terminals, a
base station 1 for a communication area E1 and a base
station 2 for a communication area E2 communicate with each
other via, for example, a central base station 3. A
15 portable radio terminal 4 in the communication area E1
communicates with the base station 1 by, for example, a
frequency division multiple access mode (FDMA mode) or a
time division multiple access mode (TDMA mode).

Fig. 2 is a block diagram of the constitution of a
20 portable radio terminal. Shown in Fig. 2 are a
transmitter-receiver antenna 10, a radio unit 11, a speech
processing unit 12, a central processing unit (CPU) 13, a
microphone 14 connected to the speech processing unit 12, a
loudspeaker 15 connected to the speech processing unit 12,
25 a ROM 16 storing control programs, a RAM 17 for temporarily
storing data being processed, a RAM 18 for storing the
respective telephone numbers of the portable radio terminal
and a called terminal, a display unit 19, an operating unit
20. The ROM 16, the RAM 17, the RAM 18, the display unit
30 19 and the operating unit 20 are connected to the CPU 13.

The operation will be described hereinafter.

When numeric keys or an abbreviated number key included in the operating unit 20 of the portable radio terminal 4 is operated for dialing in the communication
5 area E1 of the base station 1. Upon the reception of a dialing signal, the CPU 13 exchanges data with the ROM 16, and the RAMs 17 and 18 to transmit a telephone number signal indicating the telephone number of a called portable radio terminal through the radio unit 11 and the
10 transmitter-receiver antenna 10.

Upon the reception of the telephone number signal, the base station 1 sends a transmission signal through the central base station 3 to the base station 2 for the called portable radio terminal, the base station 2 transmits the
15 transmission signal to a called portable radio terminal 5, and the portable radio terminals 4 and 5 are connected to each other in a talking state. Then, the speech of the caller is converted into a corresponding electric signal by the microphone 14, the electric signal is processed by the
20 speech processing unit 12, and the processed electric signal is transmitted through the transmitter-receiver antenna 10 by the radio unit 11. The speech processing unit 12 receives a transmission signal representing the speech of the caller through the transmitter-receiver
25 antenna 10 and the radio unit 11, and processes the same, and the output of the speech processing unit 12 is converted into the speech by the loudspeaker 15.

During the above talking, the radio unit 11 receives radio waves transmitted by the base station 1 and received
30 through the transmitter-receiver antenna 10 and measures

field intensity level and circuit quality. The CPU 13 compares the field intensity level and the circuit quality measured by the radio unit 11 with certain thresholds. As mentioned in "Daini Sedai Kodoresu Denwa Shisutemu Hyoujun Kikaku Dai-Ippan (Second Generation Cordless Telephone System Standard 1st Edition) (RCRSTD-28)" issued by Zaidan Hojin Denpa Shisutemu Kaihatsu Senta (Dec., 1993), the thresholds are communicated beforehand by the base station as "handover processing level" to the portable radio terminal...

As the result of the comparison, if the field intensity level or the circuit quality is justified below the threshold, the CPU 13 provides a handover instruction and the radio unit 11 starts a handover operation upon the reception of the handover instruction.

Since the conventional radio communication system has the foregoing configuration, the handover operation is repeated at intervals of, for example, 5 sec when the quality of the received radio waves is unsatisfactory and is below the threshold even if there is no base station available for handover, and the speech is interrupted for 2 sec for the handover operation, which deteriorates speech quality greatly.

The present invention has been made to solve such a problem and it is therefore an object of the present invention to improve speech quality by reducing the frequency of the handover operation if there is no base station available for handover.

DISCLOSURE OF INVENTION

The present invention avoids unnecessarily frequent repetition of a handover operation to improve communication quality by employing a radio unit connected to a transmitter-receiver antenna, and a control unit which
5 compares either or both of field intensity level and circuit quality measured by the radio unit with thresholds, and gives a handover instruction to the radio unit if the measured field intensity level or the measured circuit
10 lowers the threshold when a handover operation carried out in response to the handover instruction is unsuccessfully executed.

The present invention avoids the unnecessary change of conditions for handover in an area where communication
15 condition is satisfactory by employing a selecting unit which selects either a procedure to change conditions for handover when a handover operation is unsuccessfully executed, or a procedure to keep conditions for handover unchanged even if a handover operation is unsuccessfully
20 executed.

The present invention reduces the frequency of an unnecessary handover operation to improve communication quality by changing time when the next handover operation can be started according as a handover operation is
25 unsuccessfully done.

The present invention reduces the frequency of an unnecessary handover operation to improve communication quality by changing either or both of a time when the next handover operation can be started, and the thresholds to be
30 compared with field intensity level and circuit quality

measured by the radio unit when a handover operation is unsuccessfully executed.

The present invention avoids the unnecessary change of conditions for handover in an area where communication condition is satisfactory by changing either or both of time when the next handover operation can be started and the thresholds to be compared with field intensity level and circuit quality measured by the radio unit when a handover operation is successful.

The present invention enables the operator to execute a forced handover operation by employing a radio unit connected to a transmitter-receiver antenna, a control unit which compares either or both of field intensity level and circuit quality measured by the radio unit with thresholds, gives a handover instruction to the radio unit if the measured field intensity level or the measured circuit quality is lower than the corresponding threshold, and lowers the threshold if a handover operation carried out in response to the handover instruction is unsuccessfully executed, and a handover executing means capable of forcibly executing handover regardless of either or both of the field intensity level and the circuit quality.

The present invention enables the operator to inhibit handover to reduce the frequency of unnecessary handover and to improve communication quality by employing a radio unit connected to a transmitter-receiver antenna, a control unit which compares either or both of field intensity level and circuit quality measured by the radio unit with thresholds, gives a handover instruction to the

radio unit if the measured field intensity level or the measured circuit quality is lower than the corresponding threshold, and lowers the threshold if a handover operation carried out in response to the handover instruction is
5 unsuccessful, and a handover inhibiting means capable of inhibiting the execution of handover regardless of either or both of the field intensity level and the circuit quality.

10 BRIEF DESCRIPTION OF DRAWINGS

Fig. 1 is a diagrammatic view of a radio communication system including portable radio terminals;

Fig. 2 is a block diagram of a portable radio terminal;

15 Fig. 3 is a flow chart of a procedure to be carried out by a radio communication system in a first embodiment according to the present invention;

Fig. 4 is a flow chart of a procedure to be carried out by a radio communication system in a second embodiment
20 according to the present invention;

Fig. 5 is a flow chart of a procedure to be carried out by a radio communication system in a third embodiment according to the present invention; and

25 Fig. 6 is a flow chart of a procedure to be carried out by a radio communication system in a fourth embodiment according to the present invention.

BEST MODE FOR CARRYING OUT THE INVENTION

The present invention will be described in terms of
30 the best mode for carrying out the invention with reference

to the accompanying drawings.

First Embodiment

A radio communication system in a first embodiment according to the present invention and portable radio terminals included in the radio communication system are the same in construction as those shown in Figs. 1 and 2. New functions are added to a radio unit 11, a CPU 13 and an operating unit 20, i.e., components of the portable radio terminal.

Fig. 3 is a flow chart of a procedure to be carried out by the radio communication system in the first embodiment of the present invention. Upon the start of the procedure, a threshold is set to a default threshold TH0 in step ST1.

As shown in Fig. 2, the radio unit 11 measures either or both of received field intensity level and circuit quality, and gives either or both of the measured field intensity level and the measured circuit quality to the CPU 13. The CPU 13 compares either or both of the measured field intensity level and the measured circuit quality with the thresholds in step ST2. A query is made in step ST3 to see if either of the measured field intensity level and the measured circuit quality is lower than the corresponding threshold. Steps ST2 and ST3 are repeated if the response in step ST3 is negative. The CPU 13 gives a handover instruction to the radio unit 11 in step ST4 if the response in step ST3 is affirmative.

Subsequently, the radio unit 11 executes a handover operation in response to the handover instruction, makes a query in step ST5 to see if the handover operation is

successfully done, and changes the threshold to a new threshold lower than the default threshold TH0 in step ST6 if the handover operation is failed. Therefore, the next handover operation is started if the measured field intensity level or the measured circuit quality is lower than the new threshold. Consequently, the frequency of repetition of the handover operation is reduced if the field intensity level or the circuit quality remains unchanged.

If it is justified in step ST5 that the handover operation is successful, the threshold is restored to the previous threshold TH0.

Second Embodiment.

Fig. 4 is a flow chart of a procedure to be carried out by a radio communication system in a second embodiment according to the present invention. In this radio communication system, a threshold is changed in steps according to the frequency of unsuccessful handover operations.

Upon the start of the procedure, a threshold is set to a default threshold TH0 in step ST11, and a handover failure frequency n is set to zero ($n = 0$) in step ST12.

A radio unit 11 measures either or both of received field intensity level and circuit quality, and gives either or both of the measured field intensity level and the measured circuit quality to a CPU 13. The CPU 13 compares either or both of the measured field intensity level and the measured circuit quality with the thresholds in step ST13. A query is made in step ST14 to see if either of

the measured field intensity level and the measured circuit quality is lower than the corresponding threshold. Steps ST13 and ST14 are repeated if the response in step ST14 is negative. The CPU 13 gives a handover instruction to the radio unit 11 in step ST15 if the response in step ST14 is affirmative.

Subsequently, the radio unit 11 executes a handover operation in response to the handover instruction, makes a query in step ST16 to see if the handover operation is successful, and increases the handover failure frequency by 1 in step ST17 and sets the threshold to a lower default threshold Th_n in step ST18 if the handover operation is unsuccessful. For example, $n = 2$ if two successive handover operations are unsuccessful and the threshold is set to a lower default threshold.

If the handover operation is successful, the handover failure frequency n is restored to zero in step ST19, and the threshold is set to the default threshold TH_0 in step ST20; that is, the initial set state is restored.

Third Embodiment

The second embodiment carries out a threshold lowering operation to lower the threshold when the handover operation results in a failure or carries out a initial threshold restoring operation to restore the initial threshold when the handover operation is successful. An operating unit 20 included in a third embodiment of the present invention is provided with a selecting means, not shown, for selecting either an operating mode in which the threshold lowering operation or the initial threshold

restoring operation is carried out or an operating mode in which the threshold lowering operation or the initial threshold restoring operation is not carried out. Fig. 5 is a flow chart of a procedure to be carried out by the
5 third embodiment of the present invention.

Upon the start of the procedure, a threshold is set to a default threshold TH0 in step ST21.

A radio unit 11 measures either or both of received field intensity level and circuit quality, and gives either
10 or both of the measured field intensity level and the measured circuit quality to a CPU 13. The CPU 13 compares either or both of the measured field intensity level and the measured circuit quality with the thresholds in step ST22. A query is made in step ST23 to see if either of the
15 measured field intensity level and the measured circuit quality is lower than the corresponding threshold. Steps ST22 and ST23 are repeated if the response in step ST23 is negative. The radio unit 11 provides a handover instruction and executes a handover operation in step ST24
20 if the response in step ST23 is affirmative.

Then, a query is made in step ST25 to see if the handover operation is successful. A query is made in step ST26 to see if the input is fixed. The threshold is kept unchanged if the input is fixed or the threshold is changed
25 in step ST27 if the input is variable. If it is decided in step ST25 that the handover operation is successful, a query is made in step ST28 to see if the input is variable. The threshold is kept unchanged if the input is fixed or the threshold is restored to the default threshold in step
30 ST29 if the input is variable.

Fourth Embodiment

In the first embodiment, the threshold is lowered if the handover operation is unsuccessful or the threshold is restored to the initial threshold if the handover operation is successful. The execution of the next handover operation may be suspended for a fixed period of time. Fig. 6 shows a procedure to be carried out by radio communication system in a fourth embodiment according to the present invention.

10 Upon the start of the procedure, handover inhibit time is set to a default handover inhibit time in step ST31. Subsequently, a radio unit 11 measures either or both of received field intensity level and circuit quality, and gives either or both of the measured field intensity level and the measured circuit quality to a CPU 13. The CPU 13 compares either or both of the measured field intensity level and the measured circuit quality with the thresholds in step ST32. A query is made in step ST33 to see if either of the measured field intensity level and the measured circuit quality is lower than the corresponding threshold. Steps ST32 and ST33 are repeated if the response in step ST33 is negative. The CPU 13 makes a query to see if handover is inhibited in step ST34 when the response in step ST33 is affirmative. If the response in step ST34 is affirmative, the procedure returns to step ST32 or a handover operation is executed in step ST35 if the response in step ST34 is negative.

Then, a query is made in step ST36 to see if the handover operation is successful. The initial handover inhibit time is restored if the handover operation is

successful in step ST37 or step ST38 is executed to change the handover inhibit time when the handover operation is unsuccessful and the procedure returns to step ST32 and the foregoing steps are repeated.

5 Thus, the next handover operation is started after the elapse of the new handover inhibit time, which reduces the frequency of handover operations.

Fifth Embodiment

10 The fourth embodiment suspends the next handover operation for a fixed period of time if the preceding handover operation is unsuccessful. The handover inhibit time may be changed in steps according to the frequency of unsuccessful handover operations. For example, if two
15 successive handover operations resulted in a failure, the handover inhibit time for which the next handover operation is suspended may be extended. The handover inhibit time may be changed according to the frequency of unsuccessful handover operations.

20

Sixth Embodiment

 Although the fourth embodiment suspends the next handover operation for a fixed period of time if the preceding handover operation is unsuccessful, the operating
25 unit 20 may be provided with a selecting means for selecting either an operation to suspend the next handover operation for a fixed period of time or an operation not to suspend the next handover operation for a fixed period of time.

30

Seventh Embodiment

Although the first to the third embodiments change conditions for handover when a handover operation is unsuccessful and the fourth to the sixth embodiments change
5 time when handover can be started, both conditions for handover and time when handover can be started may be simultaneously changed.

Eighth Embodiment

10 Although the first to the seventh embodiments change conditions for handover if a handover operation is unsuccessful, conditions for handover may be changed when a handover operation is successful. For example, it is possible to monitor the frequency of handover operations
15 continuously to change the thresholds or to change time when the handover is to be started when the frequency of handover operations exceeds a predetermined value.

Ninth Embodiment

20 Although the first to the eighth embodiments start a handover operation when the measured field intensity level or the measured circuit condition provided by the radio unit 11 is lower than the corresponding threshold, the handover may be started or may be inhibited depending on an
25 operator's request, i.e., a request signal provided by operating the operating unit 3, not depending on the output of the radio unit 11.

INDUSTRIAL APPLICABILITY

30 As is apparent from the foregoing description, the

radio communication system of the present invention lowers the threshold defining the lower limit of conditions not requiring handover if a handover operation is unsuccessful. Therefore, an unnecessary handover operation in a state
5 where any base station for handover cannot be found can be avoided to improve communication quality.

CLAIMS:

1. A radio communication system comprising: a radio unit connected to a transmitter-receiver antenna; and a control unit which compares either or both of field intensity level and circuit quality measured by the radio unit with thresholds, and gives a handover instruction to the radio unit if the measured field intensity level or the measured circuit quality is lower than the corresponding threshold, and lowers the threshold when a handover operation carried out in response to the handover instruction is unsuccessfully executed.

2. The radio communication system according to claim 1 further comprising a selecting unit which selects either a procedure to change conditions for handover when a handover operation is unsuccessful, or a procedure to keep conditions for handover unchanged even if a handover operation is unsuccessfully executed.

3. The radio communication system according to claim 1, wherein time when the next handover operation can be started is changed according as a handover operation is unsuccessfully performed.

4. The radio communication system according to claim 1, wherein either or both of time when the next handover operation can be started and the thresholds to be compared with field intensity level and circuit quality measured by the radio unit are changed when a handover operation is unsuccessfully done.

5. The radio communication system according to claim 1, wherein either or both of time when the next

handover operation can be started and the thresholds to be compared with field intensity level and circuit quality measured by the radio unit are changed when a handover operation is successfully executed.

5 6. A radio communication system comprising: a radio unit connected to a transmitter-receiver antenna; a control unit which compares either or both of field intensity level and circuit quality measured by the radio unit with thresholds, gives a handover instruction to the radio unit
10 if the measured field intensity level or the measured circuit quality is not higher than the corresponding threshold, and lowers the threshold when a handover operation carried out in response to the handover instruction is unsuccessfully executed; and a handover
15 executing means capable of forcibly executing handover regardless of either or both of the field intensity level and the circuit quality.

20 7. A radio communication system comprising: a radio unit connected to a transmitter-receiver antenna, a control unit which compares either or both of field intensity level and circuit quality measured by the radio unit with thresholds, gives a handover instruction to the radio unit
25 if the measured field intensity level or the measured circuit quality is not higher than the corresponding threshold, and lowers the threshold if a handover operation carried out in response to the handover instruction is unsuccessful; and a handover inhibiting means capable of inhibiting the execution of handover regardless of either
30 or both of the field intensity level and the circuit quality.

ABSTRACT

In a radio communication system including portable
radio terminals for communication with base stations in
5 communication areas, conditions for starting handover are
changed according to the history of handover to reduce the
frequency of handover operations and to improve speech
quality.

10

1/5

FIG.1

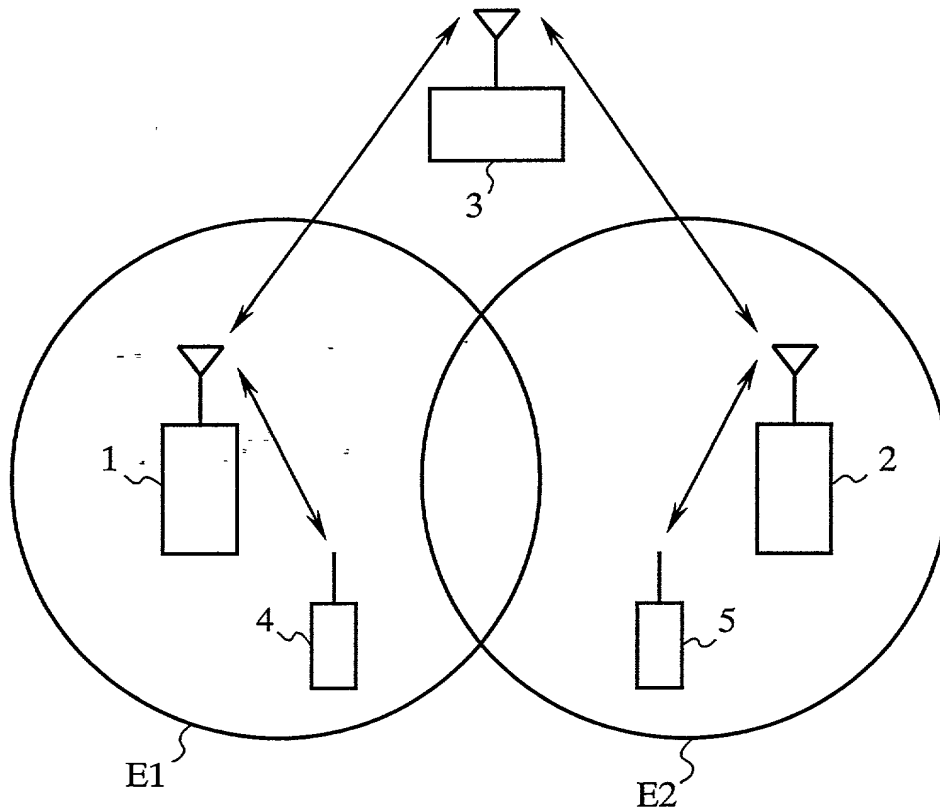


FIG.2

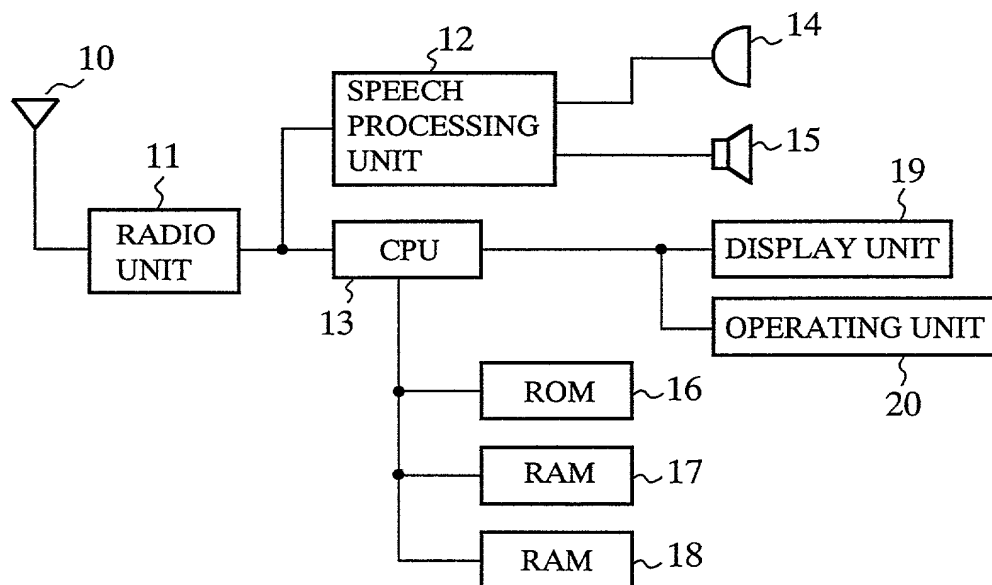


FIG.3

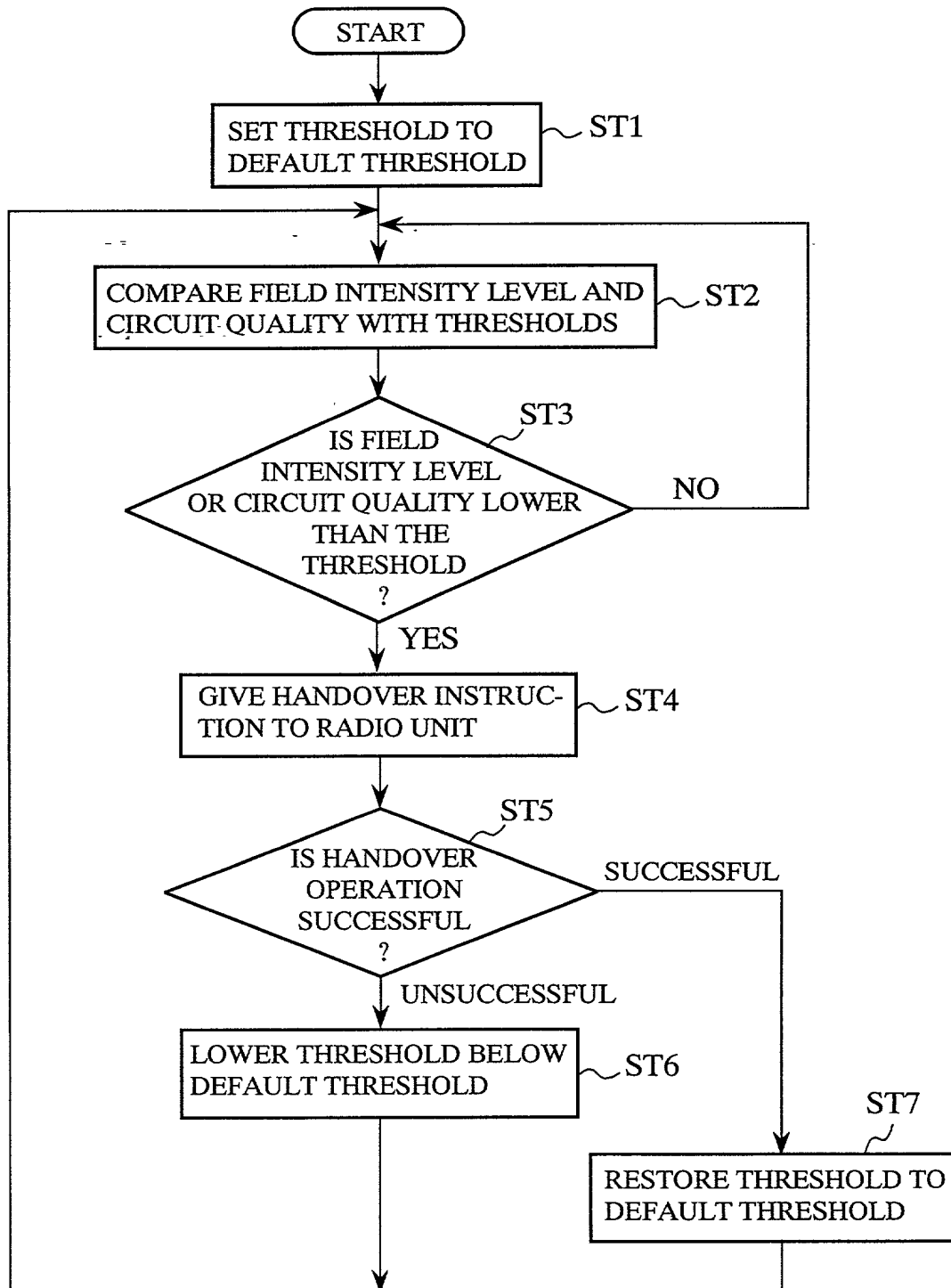


FIG.4

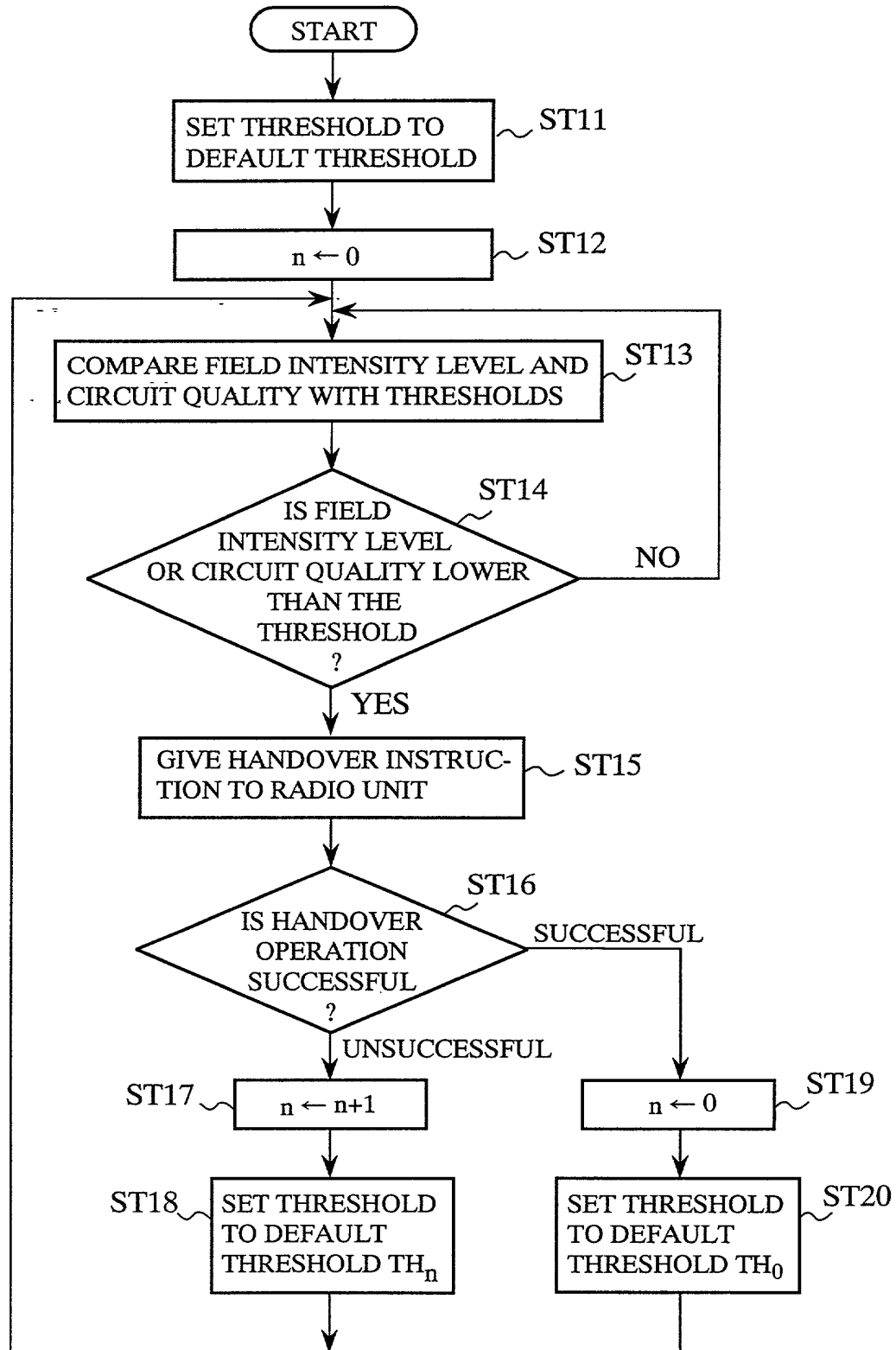


FIG.5

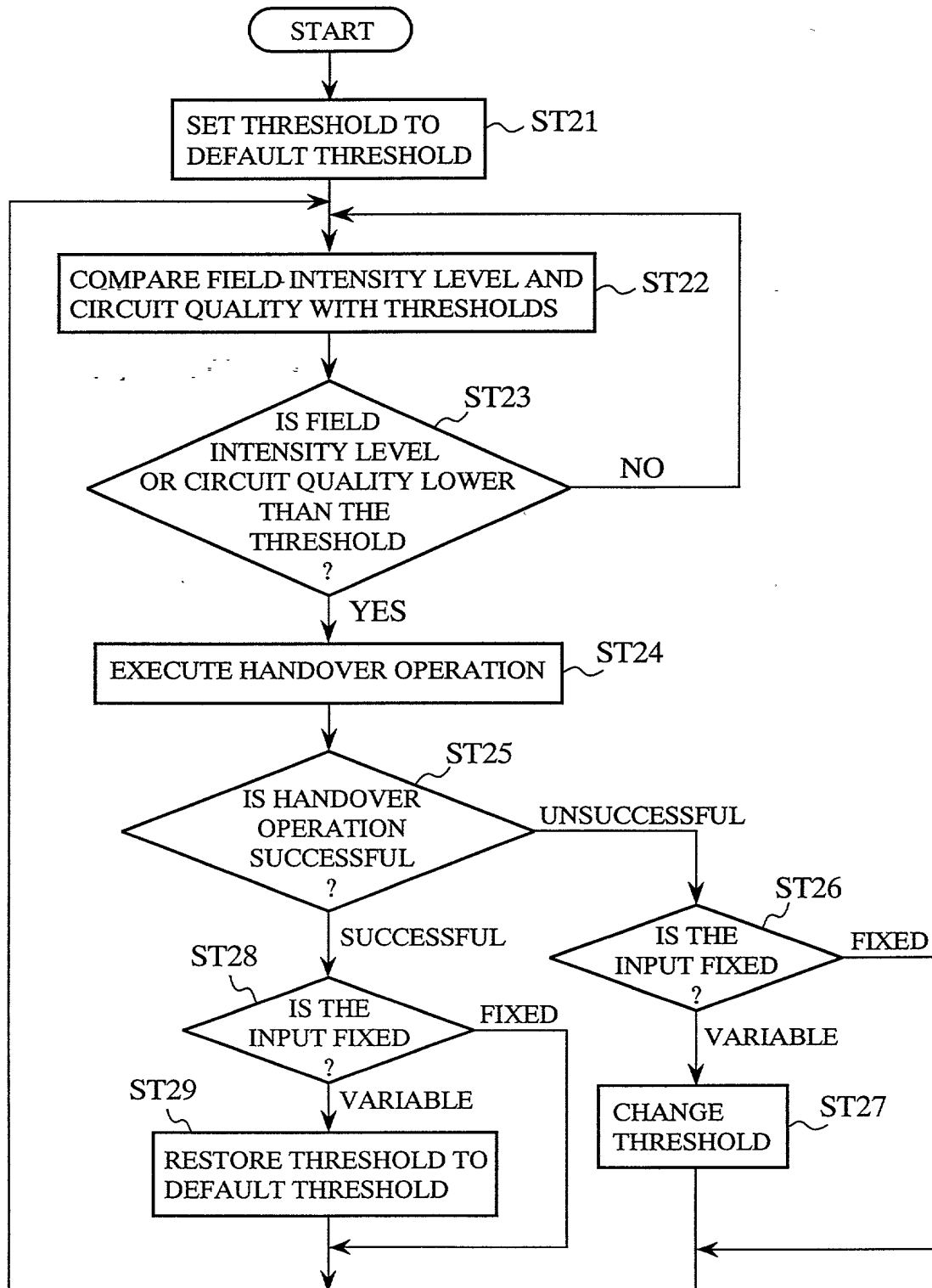
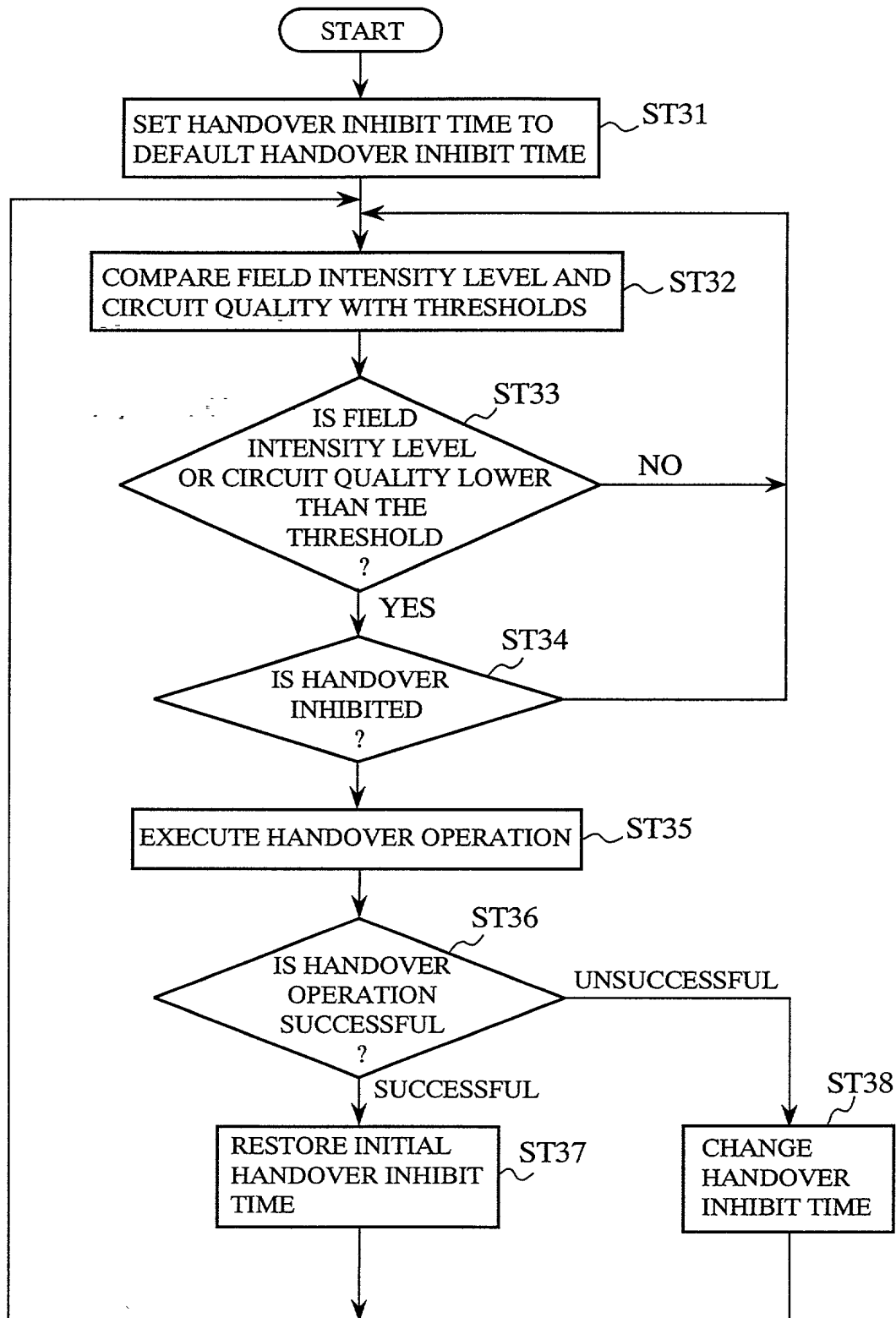


FIG. 6



**Declaration and Power of Attorney
For Patent Application
(Sole/Joint)**

As a below named inventor, I hereby declare that:

My residence, post office address and citizenship are as stated below next to my name,

I verily believe I am the original, first and sole inventor (if only one name is listed below) or a joint inventor (if plural inventors are named below) of the subject matter which is claimed and for which a patent is sought, on the invention entitled "RADIO COMMUNICATION SYSTEM"

the specification of which (Check One)

 is attached hereto.

 X was filed on December 24, 1997 as
[] Application Serial No. _____
[X] International Application No. PCT/JP97/04792
and was amended on _____

I hereby state that I have reviewed and understand the contents of the above-identified specification, including the claims, as amended by any amendment referred to above.

I acknowledge the duty to disclose information which is material to patentability in accordance with Title 37, Code of Federal Regulations, § 1.56(a).

I hereby claim foreign priority benefits under Title 35, United States Code, § 119 of any foreign application(s) for patent or inventor's certificate listed below and have also identified below any foreign application for patent or inventor's certificate having a filing date before that of the application on which priority is claimed:

PRIOR FOREIGN APPLICATION(S)

Priority Claimed

_____ (Number)	_____ (Country)	_____ (Day/Month/Year Filed)	Yes: ____ No: ____
_____ (Number)	_____ (Country)	_____ (Day/Month/Year Filed)	Yes: ____ No: ____
_____ (Number)	_____ (Country)	_____ (Day/Month/Year Filed)	Yes: ____ No: ____

I hereby claim the benefit under Title 35, United States Code, § 120 of any United States application(s) listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States application in the manner provided by the first paragraph of Title 35, United States Code, § 112, I acknowledge the duty to disclose

material information as defined in Title 37, Code of Federal Regulations, § 1.56(a) which occurred between the filing date of the prior application and the national or PCT international filing date of this application.

(Application Serial No.)	(Filing Date)	(Status)

I or we hereby appoint the following attorneys to prosecute this application and to transact all business in the Patent and Trademark Office connected therewith, and request that all correspondence about the application be addressed to ROTHWELL, FIGG, ERNST & KURZ, P.C., 555 13th Street, N.W., Washington, D.C 20004

14
G. Franklin Rothwell, Reg. No. 18,125
E. Anthony Figg, Reg. No. 27,195
Barbara G. Ernst, Reg. No. 30,377
George R. Repper, Reg. No. 31,414
Lawrence G. Norris, Reg. No. 18,034
Bart G. Newland, Reg. No. 31,282
Vincent M. DeLuca, Reg. No. 32,408
Joseph A. Hynds, Reg. No. 34,627

Michael G. Sullivan, Reg. No. 35,377
Jeffrey B. McIntyre, Reg. No. 36,867
Robert J. Jondle, Reg. No. 33,915
Moon Soo Lee, Reg. No. 37,377
Kenneth M. Fagin, Reg. No. 37,615
Stephen B. Parker, Reg. No. 36,631

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the application or any patent issuing thereon.

Full Name of Sole or First Inventor	Inventor's Signature	Date
Atsuya KUME	Atsuya Kume	August 19, 1999
Residence		Citizenship
Tokyo, Japan	SPX	Japanese
Post Office Address	c/o MITSUBISHI DENKI KABUSHIKI KAISHA, 2-3, Marunouchi 2-chome, Chiyoda-ku, Tokyo 100-8310 Japan	
Full Name of Second Joint Inventor, if any	Inventor's Signature	Date
Residence		Citizenship
Post Office Address		
Full Name of Third Joint Inventor, if any	Inventor's Signature	Date
Residence		Citizenship
Post Office Address		
Full Name of Fourth Joint Inventor, if any	Inventor's Signature	Date
Residence		Citizenship
Post Office Address		